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ABSTRACT

A brief discussion of the need to define social studies is followed by methods for developing selection criteria for microcomputer programs in the social studies, a model for lesson development on a microcomputer, and evaluation criteria. The need for educators to carefully state what should be learned is emphasized in terms of controlling the implementation of computer programs in social studies education. An overriding criterion to software selection is forwarded: the method chosen to teach any subject should aim at teaching more (in terms of content) at lower cost. A 19-item checklist supplements this criterion. The model for developing a lesson on a microcomputer is neither machine-specific nor language-specific. The flow chart depicts processes and pretests, student tutorials, mastery tests, and a system for filing results for both teacher and student. Suggestions for software evaluation criteria focus on developing a checklist which contairs a rating scale and comparing scores of program evaluations. The paper concludes that social science educators have little choice but to try to make sure that the new technology will be used properly. (KC)

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HOW TO THINK ABOUT THE NEW INSTRUCTIONAL TECHNOLOGY AND SOCIAL SCIENCE EDUCATION: MAKING PROPER DISTINCTIONS

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Paper Given at

The Social Science Education Consortium
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ABSTRACT

A critical issue for social studies educators is what to teach and to whom. The paper begins with a short discussion of the need to define social studies. Having decided the subject and audience, another important issue is how to teach. This requires criteria for method selection, the most important of which is to teach more at lower cost in terms of time and money than alternative methods can. This is followed by a list of what computers can do better than present classroom practices in many cases.

After a brief discussion of importance and meaning of novelty in social studies education, it is contended that social science educators have an obligation to spread the new technology to all students and to make sure that it does what it's supposed to do.

The importance of the use of a model or paradigm or framework in which to use computer technology is stressed. One such model that appears of wide use is then set forth.

After a discussion of some practical problems in the utilization of computers in the classroom, the paper concludes that social science educators have little choice but to try to make sure that the new technology will be used properly.

INTRODUCTION

What did the programmer do to his front and back yards last weekend? He modem.

What did the computer say to Dracula? "I'd like to take a byte out of you."

How do computers get to know each other? They data bit.

Social studies teachers who do not understand these riddles or who still think that a bit is something that goes in a horses's mouth or that a RAM is a male goat or that bytes are something passionate lovers collect or that bugs bite, will soon find that their students know more about computers than they do. A new instructional technology using computers is here now and it will get better. As social studies educators we have few choices. Our job is to be sure that the newest technology is used properly and widely.

Although computers can be helpful in teaching parts of almost any version of social studies, the controversy and imprecision with respect to the use of the term requires that it be defined if discussion is to be fruitful. For the purposes of this paper social studies are the name given to social science when social science is adjusted for teaching purposes in the elementary and high schools.

The Barth-Shermis and other literature makes it abundantly clear that many things are being done in the name of social

studies which even their proponents have not bothered to justify with a detailed rationale or even a defensible scope and sequence argument.[1] Ideologues of all kinds have inserted into the curriculum extremely complicated issues upon which experts and scholars cannot agree such as nuclear war, creationism, animal rights and gun control, and censorship and racism.

One of the reasons for the difficulties with respect to the definition of the social studies and its scope and sequence is that ideologues of the left and the right, conservatives and liberals and many other groups have used the social studies in an attempt to forward their own interest and prejudices. One of the practical consequences of this has been the decline of the social studies because most Americans do not agree with narrowly defined ideologies.

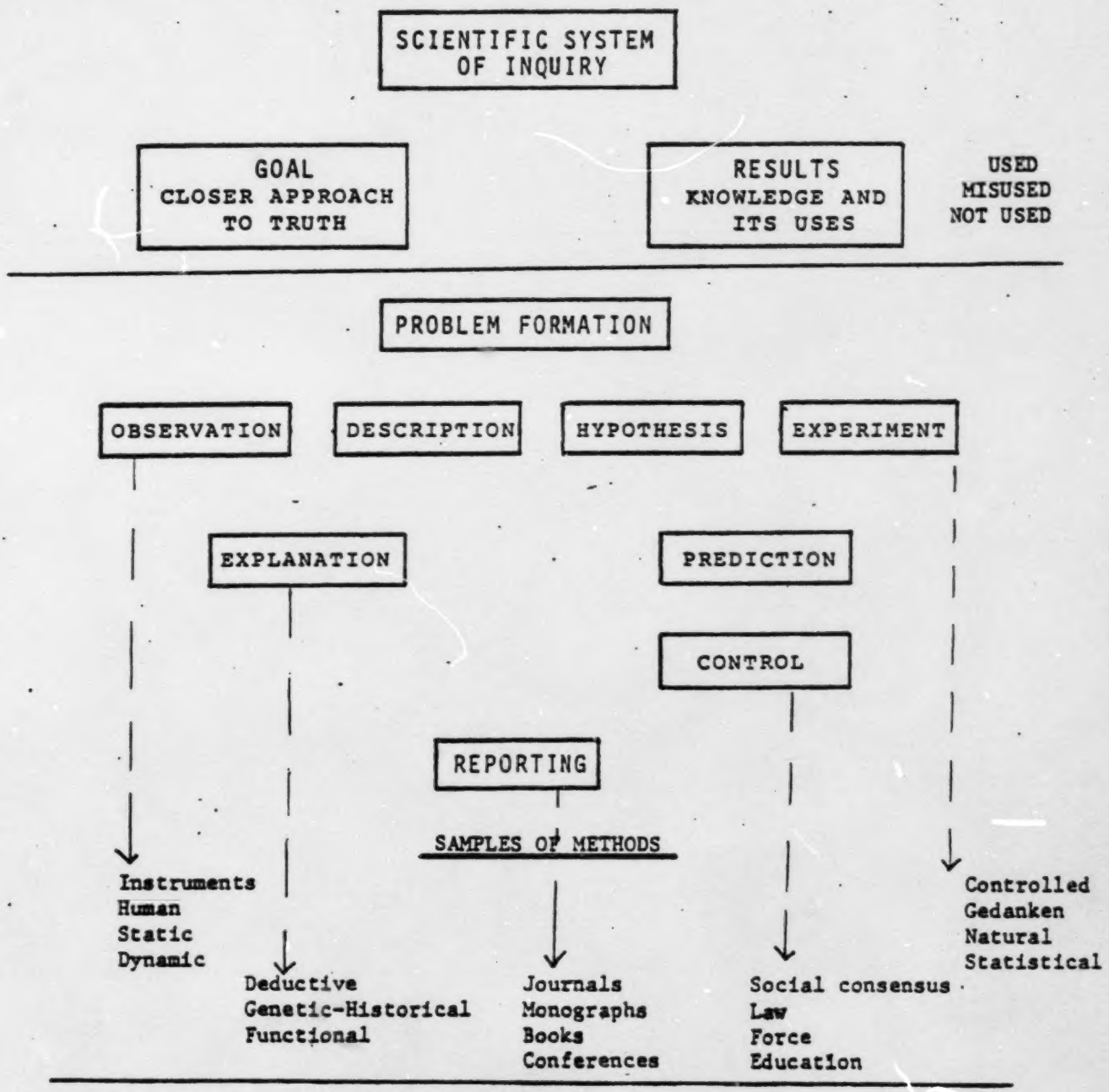
It is important therefore, to understand what we are talking about when we speak of social science or social studies particularly when there is a possibility that the new technology could, if properly understood, help with the restoration and development of social studies. Illustrations 1 and 2 show in schematic form what scientists themselves consider science to be and what the social sciences are.[1A]

In addition to the intellectual and pedagogical reasons for more precise definitions of social studies, the tool we are discussing makes special demands of its own. Computers can be

ILLUSTRATION 1

SCIENCE IS

1. What is accepted as knowledge
2. A large number of methods
3. A practice with specific assumptions and attitudes



SOME THINGS SCIENTISTS MUST BELIEVE - MOST OF THE TIME

OBJECTIVE REALITY
TIME
SPACE
PURPOSE
CAUSE
CONNECTIONS BETWEEN SYMBOLS AND REALITY

SEVEN PRACTICAL WAYS THE UNITY OF SCIENCE EXISTS

HISTORY
SUBJECT
METHODS
CONCEPTS OR PRINCIPLES
PARADIGM
ORCHESTRATION
PROBLEMS

thought of as perfectly obedient dumb slaves. They do exactly and only what they are programmed to do. It follows that if they are to do anything useful with social studies, the people who develop programs for them must know what they are about.

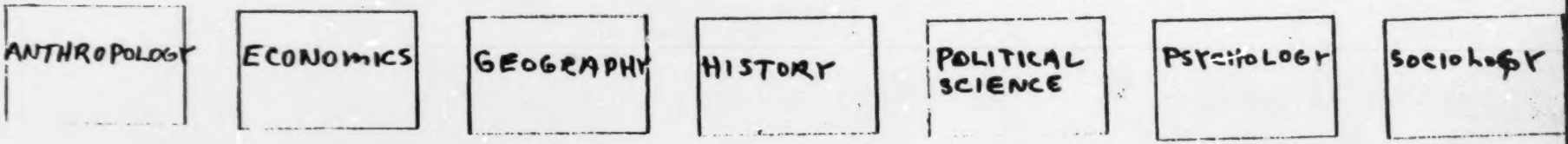
The necessity of defining what we want learned with the new technology can hardly be overstated. If we do not carefully state what we want learned, then we can expect that the tools themselves, teaching methods, ideologies or market forces will control the implementation of computers in social studies.

Once we have decided what we want to teach the next question is to whom? The implied answer in much of the literature is that we want everybody to learn social studies. Mandates of various kinds are examples of this as are the statements of special interest groups such as the National Council for Social Studies. This approach to our problems is both uncritical and unreal and probably another important reason for the decline of social studies in the United States. The idea that we can teach everybody approximately the same thing is unsound theoretically. The idea is unreal because of the size and diversity of the educational establishment in the United States.

Those of us working with the new computer technology must be guided by what we regard as fundamental components of social studies for people of selected age or grade, or intellectual,

HOW THE SOCIAL SCIENCES ARE RELATED

THE BASIC SEVEN



THE APPLIED SOCIAL SCIENCES

EDUCATION

LAW

PENOLOGY
OR
CRIMINOLOGY

PLANNING

SOCIAL WORK

Behavioral Science

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and physical stages of development.

Criteria For Selection

Once we have decided what we want to teach and to whom another very important distinction is required - how we will do it. There are many ways including the entire range of conventional techniques. This discussion emphasizes instructional techniques using microcomputers for the reason that the microcomputer is both a qualitative and quantitative jump over the machines which have aided teaching in the past. And even this is only a beginning. Within a few years we will have cheap, commercially available computer controlled video systems. But this is only a qualitative improvement and will simply carry forward what is now available another step.

The major quantitative leap has been made. Radio, film, film strips, television, large main frame computers using systems like Plato and mini computer systems are all mechanical devices which are useful in teaching. But the microcomputer, especially when utilizing video techniques on the television screen, combines the advantages of them all and adds some of its own.

The issue then becomes what the criteria are for deciding why and when we should use one method rather than another. A search of the literature showed very little explicit dis-

cussion of this central educational issue.[2] One criterion that ought to be considered as very important, perhaps the most important, is that the method chosen to teach any subject should aim at teaching more, at lower real costs, in terms of time and money. By teaching more we mean, of course, a demonstrable increase in learning as shown by such measures as pre and post tests. But that is not enough.

A few economists aside, the vast bulk of literature on education that discusses the advantages of teaching one way rather than another does not take into account the costs in terms of student time and effort or the money costs of teachers, including their training, and materials and facilities. A limited survey of projects that cost tens of millions of dollars which were intended to improve social studies in the 1960's and 70's, shows that none seriously addressed this question. There is little doubt that if one examines the evaluation efforts of the projects upon which billions were spent, one would find similar neglect. Here is another reason for the small success of so many well-intentioned projects. They do not take into account the actual or imputed costs of what they are intending to teach compared to the alternatives.

The criteria proposed for selecting a method for teaching something therefore, is that the most appropriate method teaches more, at lower cost, in terms of the time and money

spent. Secondary criteria which often involve trade-offs with the primary criteria are that better methods teach students with more fun, are faster, and are tailored to individual needs, aptitudes and attitudes.

Some program developers, unfortunately mostly not in social studies, are already following these criteria with great success. Examples of some who have benefited are handicapped people, students with access to Plato, middle and upperclass students with home computers, those who can afford to go to computer camps and those in the richer or more advanced school districts.[3]

This raises another important issue beyond the scope of my paper but worth mentioning. Because social studies educators have not thought these issues through, we are well on our way to a new kind of social division based upon our failure to fully participate in this new technology. An examination of the main catalogs of computer software will show that there is very little material for the social studies. Most evaluations of most of what is available are that it is not worthwhile. Try to find social studies programs with pre and post tests, for example.[4]

Since so much is made of the idea that this technology is new for the social studies the question of what is new and its meaning becomes relevant here. Obviously for most social science educators the microcomputer is new. Why should we care about what is new, assuming, of course, that we reject novelty for its own sake except on a very limited scale. We should care

about new things if they meet the criteria stated above. Although all the evidence is not yet in there is little doubt that computers can do many things better than present educational practices. The following checklist reprinted from Social Education, May 1983 shows some of these uses.

Checklist 1

What Can A Computer Do Better Than Present Educational Practices?

I. More effective learning

- A. Save time of
  1. Student
  2. Teacher
  3. Other members of the educational team
- B. Less cost for same or more learning
- C. More fun or less work for same or more learning
- D. More individualized instruction
  1. Self-paced
  2. More patience than peers or teachers
  3. Immediate and objective feedback
  4. Automatic adjustment of lesson difficulty
  5. Widen variety of learning styles
- E. More motivating
- F. Higher interest levels
- G. Dynamically organize complext materials through graphics and sound for different perceptual modes.

II. Offer more courses.

III. Offer a wider variety of learning methods.

- A. Inquiry and dialogue.
- B. Tutorials.
- C. Simulations and models.
- D. Educational games.
- E. Testing
- F. Skill and drill.

IV. Others.

- A. Faster and more accurate record keeping.
- B. Often cheaper than texts, workbooks, hands-on or equivalent learning materials.
- C. Easier preparation, scoring and administration of tests.
- D. Cheaper, easier and faster preparation of handouts and other classroom materials.
- E. Easily accessible data bases for student projects.

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If we grant that in many of its uses this new tool meets important criteria for use then a central issue for social science educators is to spread this technology to all appropriate students and make sure that it does what it is supposed to do.

One Model For Lesson Development

In order for social studies educators to effectively participate in the new technology, they will have to have some model for lesson development. This model or paradigm or at least understanding of how computers can work is an obvious requirement if lessons on the computer are to meet reasonable educational criteria. My examination of the literature finds very little explicit discussion of models for lesson development on microcomputers.[5] The following discussion therefore should be understood as a sample of what a model might include.

To clear the ground however, we should all be aware of some implicit models for lesson development. These are authoring languages. By an authoring language we mean a language embedded in a set of computer programs which allow an author who knows the language to set up lessons. The oldest and by far the most extensively utilized so far, is the Plato system. It uses a specialized language called Tutor. Tutor has

many versions which run under the Basic language for many of the most popular machines such as Apple and Pet.

Originally Plato was developed for large main frame computers. Recently an extensive program of modifying some lessons to run on small microcomputers such as the Apple II, the IBM PC, the Atari 800 and the TI 99/4A.[6]

Another authoring system is PASS, an acronym for the professional authoring software system developed by the Bell & Howell Company. "It is currently licensed to industrial trainers at $15,000 per year with an annual software maintenance fee of $3,000." However Bell & Howell now has an extensive program which will allow authors to use the PASS system at no charge. The PASS system uses the Apple computer. Like Pilot it aims to allow "a competent expert or instructional designer to create a lesson without being a computer programmer. PASS has a pre-determined instructional methodology already built into it, ..."[7]

The third major system is C.A.S., the coursewear authoring system developed by the Digital Equipment Corporation. It is designed for use on the VAX computer and "for a non-profit educational institution, a C.A.S license is only $6,000 - for all others $9,000."[8]

Although only Bell & Howell admits it, all of the major and the other minor authoring systems such as Pilot and En Basic have an implicit instructional methodology. Unless their methodology is your

methodology, these systems are of limited use. They are however, very powerful and flexible so they will fit many needs. Even if they do fit an educator's needs, the C.A.S. and PASS system are so machine specific that they seriously limit the educational market.

The model that follows is not machine-specific, nor is it language-specific. By that we mean the model is intended to be utilized on any of the microcomputers now available and the program can be programmed in any of the major languages like Basic.

Illustration 3, "Model of a Lesson on a Microcomputer," includes most of what a lesson should include.

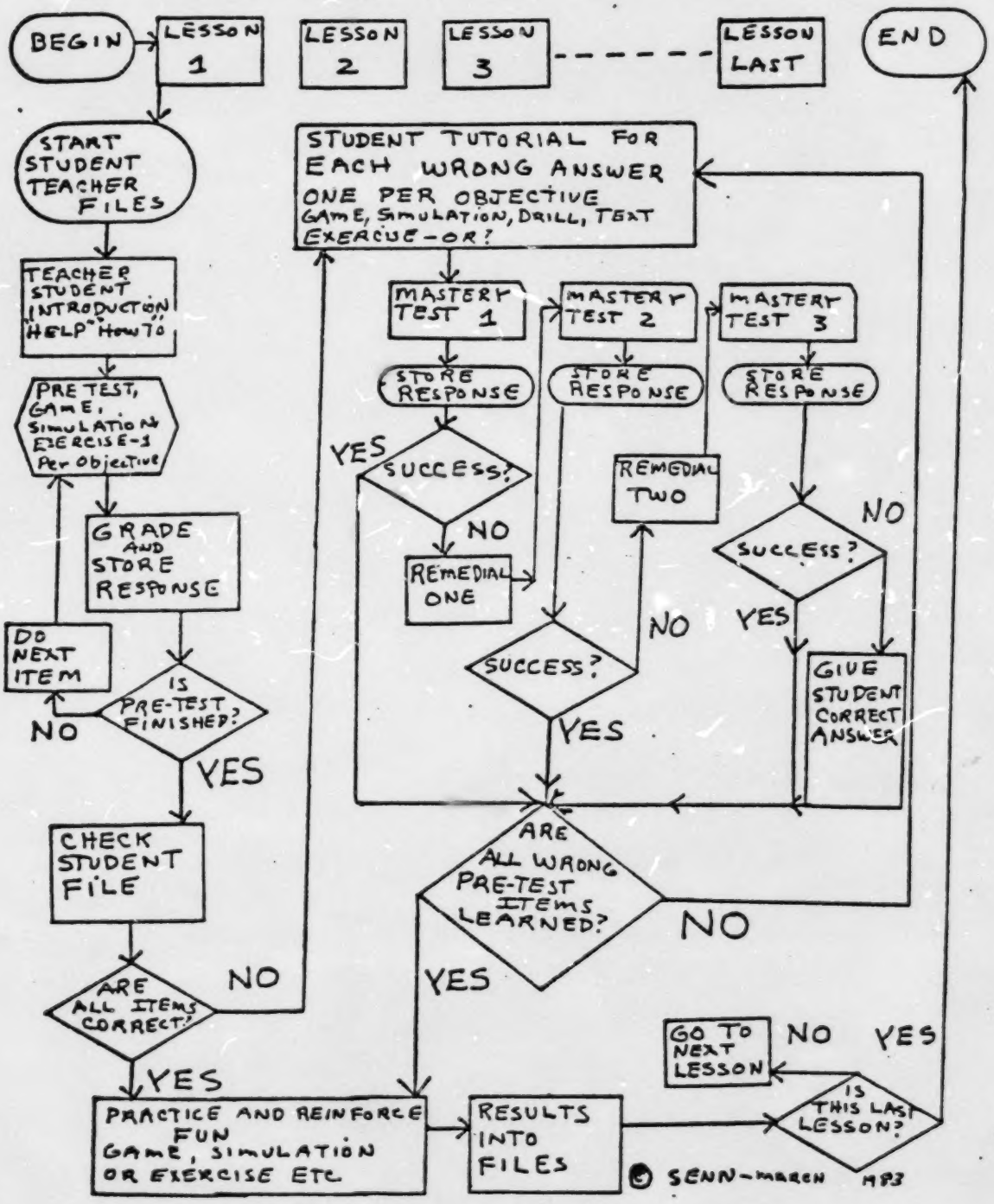
Each lesson will have a game, simulation, exercise or test at the start. This is a pretest which covers the learning objectives of the program. The responses will be stored. If the student knows all the material in the lesson, s/he will go immediately to some kind of practice or reinforcement activity - most typically a game or exercise.

For each learning objective that the student does not know, the computer will direct the student to a tutorial or learning exercise of some kind. At the conclusion of this tutorial will be a test in the form of a game, exercise, simulation or test.

If the student has mastered the objectives of the lesson, the computer will direct the student to a lesson which covers

ILLUSTRATION 3

MODEL OF A LESSON ON A MICRO COMPUTER



the next missed item of the pretest.

If the student has not mastered the material in the lesson as shown by the first test, two more remedial lessons will be available. Each of these remedial lessons will have its own test. If the student has not mastered the material after the three remedial lessons, s/he will be given the correct answer and directed to the next missed item of the pretest just as if s/he had completed the material successfully.

When all the items missed on the pretest have been successfully mastered, the student will go to the reinforcement material previously discussed.

All results of student activities will be stored in files. Some results will be reported to the student, some to the teacher, and some saved for research purposes.

What has just been sketched is a very general outline of what a model should include. It raises many questions, the answers to which will undoubtedly modify the model. For example, there appears to be virtually nothing in the literature to tell us about the relative effectiveness of the kinds of learning materials, exercises, tests, games, simulations, etc., which suit students of different age-grade levels or interests and aptitudes.[9]

Evaluation

The ultimate test of any model will be its evaluation. My search of the literature has turned up no serious discussion of the problem of evaluating a learning model for microcomputers. Of course, there are evaluations of specific lessons on microcomputers. We can learn much from those evaluations that will ultimately help us in developing what we need, a literature on evaluation of the models themselves, or in Gene Glass' terms, a meta model. This more general model must have many dimensions, some parts of which have already been published as a series of checklists.[10] The items on the checklists can be taken as the attributes of a model. Being attributes of a model they can be used for evaluation.

To use checklists for evaluation requires that some measure of worth be attached to each item. The evaluator must decide how important each item is for the uses being considered. To do this a rating scale is often useful. The scale might be from zero to ten with zero indicating absence of the characteristic or its total lack of relevance. Ten would then mean the characteristic is of the greatest importance or absolutely required. The scale depends on what is most convenient for the evaluator.

Each item on the check list is then given a score before any actual program is examined. The next step is to examine the program and rate it using the same scale. Two scores will be the result of this process. One will be the ideal and the

other the actual. They can then be compared and some measure of trade-offs established.

Using scores also makes comparisons between two or more programs more explicit. The totals tell which rate most highly. The scores on the individual items tell what trade-offs will have to be made for one choice rather than another.

An example using just three items from the list of possible advantages of using a computer can illustrate the process of evaluation.

Item	Rating of Importance	Program A	Program B
Save Student Time	5	8	5
Less Cost	10	4	7
More Fun	10	9	6
Totals	25	21	18

The total of program A is highest. But is it closest to what is desired? Notice that the score for Saving Student Time is very high." But according to the rating of importance it is not very important. Perhaps the other program is better after all! It is easy to see that many possibilities for evaluation are possible. Each person should use the one best suited for

the given application. The checklists will make the whole process more rational - not necessarily easier.

Summary and Conclusions

Much work will be required if social studies educators are to join the modern world using microcomputer technology. The new technology requires much higher degrees of precision in thinking about what one wants to do if it is to be done effectively. Because we are working with machines, a thorough understanding of the machine is required. Because we are working with people we have to know much more about how people learn when using machines.

We are in very early days. My search of the literature has turned up very little research in social studies education about facility use and microcomputers.[12] I know of one program that purports to teach the alphabet which begins by asking the student to type their name! Both the machines and the students have multiple roles and we know little about their interface.

It seems well established that if a task can be defined precisely, machines can do it better than humans. It is because the operations can be exactly specified that machines can both add and teach adding so well. Because concepts like "citzenship" can not be precisely defined, machines teach

poorly, if at all. Teaching and learning are very complex processes. In order to use the machines appropriately we are going to have to understand these processes in much more detail. We need models of how things should work and then tests of how they really do work.

The technology for a great leap forward in social studies education is here now. It will get better. As social studies educators we have little choice but to ensure that is used properly.

FOOTNOTES AND REFERENCES

1. James L. Barth and S. Samuel Shermis, "Social Studies Arguments Without Historical and Philosophical Foundations Are Still Beside The Point or...," Theory and Research in Social Education, summer 1981, V.6#9, No.2, has references.

1A The term "science" as it is used in social science refers to three very different things. It is a body of a special kind of knowledge that is capable of being falsified. It is a system of inquiry. And it is a body of methods.

The goal of scientific activity is knowledge, an increasingly closer approach to truth. Most scientists hope that the knowledge will be used for good purposes. All scientific conclusions are tentative and subject to change.

Scientists are those who practice science. Their work shows they share certain fundamental beliefs. They act as though they believe in: objective reality, time and space, relationships between symbols and reality, purpose, reason or logic, non-violence and causality. A case could be made that these beliefs are necessary to be a scientist even though not all scientists would agree on any one set of definitions of them.

The scientific system of inquiry has well defined parts, each with its own protocol or set of standards. These are problem formulation, observation, description, explanation, experiment, prediction, control and reporting. Only the first and last of these are necessary parts of scientific

activity. The other parts can be combined in almost any way in a scientific work.

Methods exist for each of the parts of the system of inquiry. Covering all of the parts are methods of logic, reasoning, and measurement. The whole system is self-correcting. It is not time-bound and will live forever if reasonably managed.

The disciplines of social science are anthropology, economics, geography, history, political science, pyschology, and sociology. The applied social sciences are planning, education, social work and the law.

Behavioral science is also though to be a part of social science although there is little agreement about any definition. Despite the fact that some historians prefer to think of themselves as writing literature and some geographers stick strictly to physical features, the evidence is overwhelming that they are minorities.

See also, Peter R. Senn, Social Science and its Methods (Boston: Holbrook Press Inc., 1971).

2. For example, see the results of ERIC search using such descriptors ("Criteria for use of educational methods") as "teaching methods, selection criteria." None of the seven references was latter than 1977.

3. A sample is Rudy Auslander, "Computers for the Hearing

Impaired," Classroom Computer News: The Magazine for Teachers and Parents, March 1983, p. 70.

A good story about computer camps is: Dennis C. Nystom, "Computer Camps. Starting Them Out Early," Information Systems, October 1982, pp. 33-40.

4. To confirm this see any catalog of educational materials and compare the number of programs in social sciences with those in other fields such as mathematics, reading or science. And this is true at every grade level. Further evidence can be found in the quotations of social studies educators who have looked for software. For a sample of this see "Convention Highlights: Special Features, NCSS Looks at the Computer Revolution", A convention roundup by Molly L. Cohen on Page 186 and following of Social Education, March 1983.

A notable exception is "Wheels Deals" prepared by Dennis Weidenaar at Purdue which contains pre and post-tests in the print material.

5. See the results of ERIC search which yielded 11 items. The main thing it showed was the wide diversity of usage of "models."

6. Mike Smith, "Pilot Tutorial II," Creative Computing, Vol. 8, No. 12 (December 1982); p. 243ff. Plato lessons can be obtained from the Control Data Publishing Company, P.O.Box 261127, San Diego, Ca. 92126.

7. The quotations are taken from the brochure published by Bell & Howell, Interactive Communications Division, pg. 1 and 3. I received my copy from Dr. Barbara Boyer, 7100 McCormick Rd., Chicago, Illinois 60645.

8. The information about C.A.S. was from the advertisement in Hardcopy. The Magazine of Digitial Equipment News, April 1983, Vol. 12, No. 24, pg. 111.

9. See, for example, the results of an ERIC search using broad descriptors which turned up 47 items. Judging from the abstracts, none seemed worth looking up.

10. The checklists referred to are published in Social Education, forthcoming, May, 1983.

12. An ERIC search turned up four articles. One dealt with museum use, another with a network, and the third discussed both administrative and academic need. The most useful was Peter Coburn et. al., "How To set up a Computer Environment," Classroom Computer News, Vol. 2, No. 3 (January/February 1982); p. 29 ff.

11. Too high in fact! The example illustrates a common mistake in the use of checklists. No rating should be higher than the pre-determined maximum. Some check-list weighting schemes use a different approach to avoid this difficulty.